Precalc Warm Up #5-4

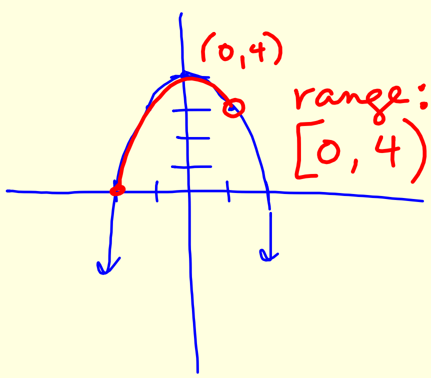
Describe the transformation(s) under the following mappings

a) $x^4 \mapsto \frac{1}{2}(4x-2)^4 - 2$

b) $\sqrt{x} \mapsto -3\sqrt{8x} + 2$

HW Questions: p. 113

2. Find the range for each of the following.



(h) $y = 4 - x^2, -2 \le x < 1$

5. Determine the implied domain for each of the following relations.

(c) $y = \sqrt{16 - x^2}$

(f) $y = \dfrac{2}{x^2 + 1}$

(i) $y = \dfrac{a}{\sqrt{x - a}}, a > 0$

$x - a > 0$

$\boxed{x > a}$

(l) $axy + y - x = a, a > 0$

$axy + y = a + x$

$\dfrac{y\cancel{(ax+1)}}{\cancel{ax+1}} = \dfrac{a + x}{ax + 1}$

$y = \dfrac{a + x}{ax + 1}$

$ax + 1 \neq 0$

$ax \neq -1$

$\boxed{x \neq -\frac{1}{a}}$

p. 187 State the parent g(x), describe transformations, then state f(x) in terms of g(x).

3 (b) $f(x) = 4 - \frac{1}{2}x^2$ $\left.\begin{matrix} g(x) = x^2 \leftarrow \text{parent} \\ f(x) = -\frac{1}{2}x^2 + 4 \end{matrix}\right.$

$\boxed{f(x) = -\frac{1}{2}g(x) + 4}$

d: Vertical compression of $\frac{1}{2}$

r: r_x

S: up 4

(e) $f(x) = \dfrac{2}{1 - x}$

(h) $f(x) = \dfrac{1}{2(2 - x)}$ → simplify f(x):

$f(x) = \dfrac{1}{-2(x-2)}$

$f(x) = -\frac{1}{2}\left[\frac{1}{x-2}\right]$

d: vertical compression of $\frac{1}{2}$

r: r_x

S: Rt 2

parent $g(x) = \frac{1}{x}$

$\boxed{f(x) = -\frac{1}{2}g(x-2)}$

(k) $f(x) = -(1 - x)^2$

(n) $f(x) = \frac{1}{2}\sqrt{2 - \frac{1}{4}x}$

[redacted]

p. 187 State the parent g(x), describe transformations, then state f(x) in terms of g(x).

3(b) $f(x) = 4 - \frac{1}{2}x^2$

(e) $f(x) = \frac{2}{1-x}$ → $f(x) = \frac{2}{-(x-1)}$

(h) $f(x) = \frac{1}{2(2-x)}$

(k) $f(x) = -(1-x)^2$

(n) $f(x) = \frac{1}{2}\sqrt{2 - \frac{1}{4}x}$

[redacted]

Simplify f(x):

$f(x) = \frac{2}{-(x-1)}$

$f(x) = -2\left[\frac{1}{x-1}\right]$

$\boxed{f(x) = -2\,g(x-1)}$

d: vertical stretch of 2

r: r_x

s: R+ 1

parent: $g(x) = \frac{1}{x}$

k) $f(x) = -\left[-(x-1)\right]^2$

r_x r_y R+ 1

$f(x) = -\,g(1-x)$

p. 187 State the parent g(x), describe transformations, then state f(x) in terms of g(x).

3(b) $f(x) = 4 - \frac{1}{2}x^2$

(e) $f(x) = \frac{2}{1-x}$

(h) $f(x) = \frac{1}{2(2-x)}$

(k) $f(x) = -(1-x)^2$

parent: $g(x) = \sqrt{x}$

(n) $f(x) = \frac{1}{2}\sqrt{2 - \frac{1}{4}x}$

(q) [redacted]

Simplify f(x):

$f(x) = \frac{1}{2}\sqrt{-\frac{1}{4}(x-8)}$

$= \frac{1}{2}\sqrt{\frac{1}{4}}\,\sqrt{-(x-8)}$

$f(x) = \frac{1}{4}\sqrt{-(x-8)}$

vertical compression of $\frac{1}{4}$

r_y

R+8

$f(x) = \frac{1}{4}\,g(8-x)$

Direct Variation:

The amount of money I earn when I collect cans VARIES DIRECTLY as the number of cans I collect.

A = Amount of money earned
n = number of cans turned in

$\boxed{A = kn}$ where k is called the "constant of variation" In Oregon, what is k? → $K = 0.05$

$A = 0.05n$

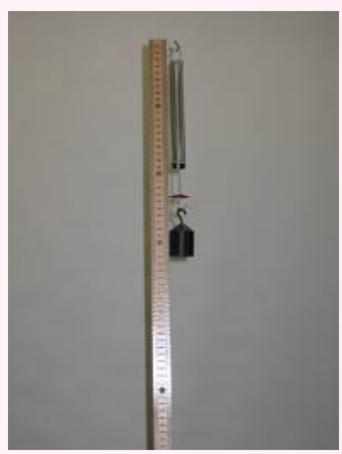
Example from Physics:

Hooke's Law for a spring states that the distance a spring is stretched (or compressed) varies directly as the force on the spring. A force of 20 lbs stretches the spring 4 inches.

a. write an equation relating the distance stretched to the force applied.

$d = kf$
$4 = k(20)$
$k = \frac{1}{5}$

$\boxed{d = \frac{1}{5}f}$



b. How far will a force of 30 pounds stretch the spring?

$d = \frac{1}{5}f$
$d = \frac{1}{5}(30)$
$d = 6$ inches

Another example from Physics:

The distance a ball rolls down an inclined plane is directly proportional to the square of the time it rolls. During the first second the ball rolls 8 feet.

a. Write an equation relating the distance traveled to the time.

$d = kt^2$
$8 = k(1)^2$
$k = 8$

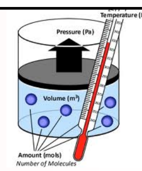
$\boxed{d = 8t^2}$

b. How far will the ball roll during the first 3 seconds?

$d = 8t^2$
$d = 8(3)^2$
$d = 72$ feet

Some things vary INVERSELY.

The model is $y = \frac{k}{x}$ $\quad V = \frac{kt}{p}$



For example: A gas law states that the volume of an enclosed gas varies directly as the temperature and INVERSELY as the pressure. The pressure of a gas is 0.75 kilograms per square centimeter when the temp is 294 K° and the volume is 8000 cubic centimeters.

a. Write an equation relating the pressure, temp, and volume of this gas.

$V = \frac{kt}{p}$ $\quad 8000 = \frac{k(294)}{0.75}$ $\quad \boxed{V = \frac{1000t}{49p}}$

$k = \frac{1000}{49}$

b. Find the pressure when the temp is 300° K and the volume is 7000 cubic centimeters. (Give answers to 3 significant figures)

$(49p)(7000) = \frac{1000(300)}{\cancel{49p}} \cdot \cancel{49p}$

$\frac{343000p}{343,000} = \frac{300,\cancel{000}}{343,\cancel{000}}$

$p \approx 0.875 \ \frac{kg}{cm^2}$

The previous example used JOINT VARIATION, where there were more than two variables involved. Here is another example of this:

The load (L) that can be safely supported by a beam varies jointly as the width (w) of the beam and the square of its depth (d^2) and inversely as the length (l) of the beam. A 10 foot long 2 x12 (depth by width) board made from pine will support a 200 pound person. What weight could be supported by a 20 foot long 3x6 pine board?

$$L = \frac{kwd^2}{l}$$

$$200 = \frac{k(12)(2)^2}{120} \leftarrow \left\{ 10 \text{ feet} = 120 \text{ inches} \right.$$

$$k = 500$$

Equation: $\boxed{L = \frac{500wd^2}{l}}$

$$L = \frac{500(6)(3)^2}{240} \leftarrow 20 \text{ ft} = 240 \text{ in}$$

$$L = 112.5 \text{ lbs}$$

What effect will doubling all of the dimensions have

$$L = \frac{500wd^2}{l}$$

$$L = \frac{500(\cancel{2}w)(2d)^2}{(\cancel{2}l)}$$

$$L = \frac{500w(4d^2)}{l}$$

$$L = \frac{2000wd^2}{l} \rightarrow$$

The load will be 4 times greater.

Read pages 162 - 166 and/or read through the slides online tonight if you need help.

HW: PC book

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